

Pacific Northwest Ballast Water Test Facility

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Today.....

- ▶ Introduction to ballast water treatment
 - Imperative
 - What's available
 - How treatments will be evaluated
- ▶ Testing and verification sites
- ▶ PNW test facility
- ▶ Process for moving to on-board treatment

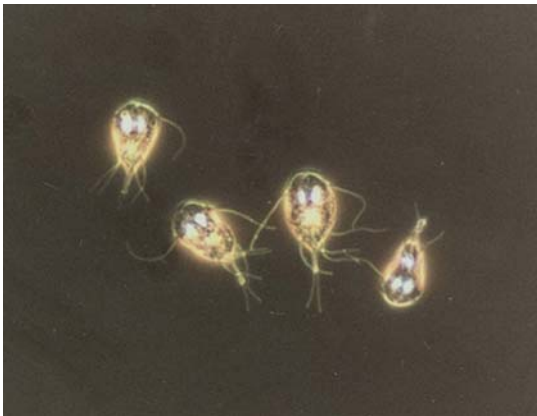


Ballast Water Treatment – Why Bother?

- ▶ Economic losses
- ▶ Environmental losses
- ▶ Public health risk
- ▶ Synergy with climate change



Sea Grant



CRD Public Health



Greg Jensen

Ballast Water Treatment – Why Bother?

- ▶ Legislative/Regulatory Imperative
 - IMO has regulations now
 - Coast Guard regulations coming soon
 - Standards to be set by USCG; differ from IMO, CA
- ▶ BW exchange versus treatment



Ballast Water Treatment Technologies

- ▶ Treatment technologies under development
 - Llyods of London says: 24-26 (2007)
 - CA State Lands Commission says: 28 (2008)
 - Lots not known about many technologies listed

- ▶ Technologies use active or inactive processes
 - Active processes: chlorination, peracetic acid, SeaKleen, ozonation
 - Inactive processes: UV, gas injection, deoxygenation, ultrasonic, cavitation, heating

Testing BW Treatment Technologies

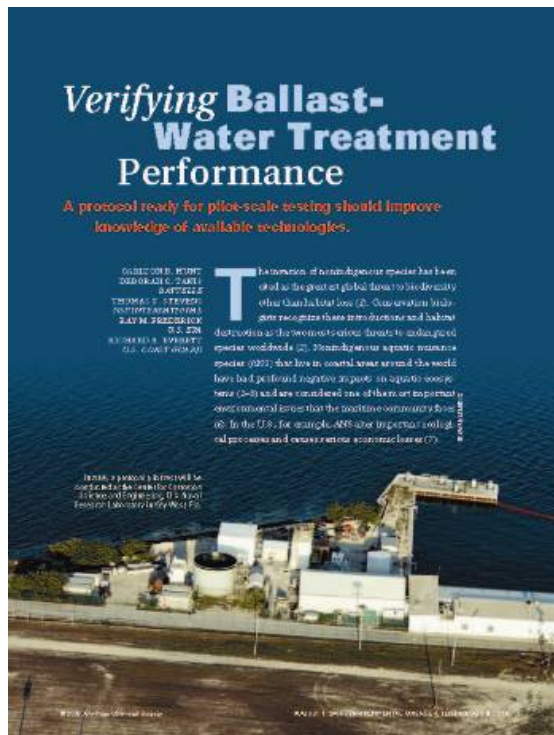
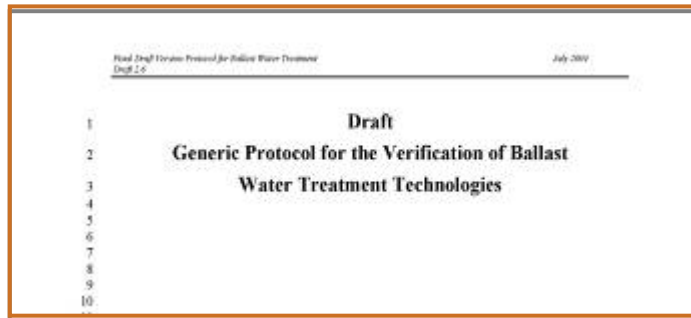
- ▶ Initial protocols by ETV for US, IMO for rest of the world

ETV:

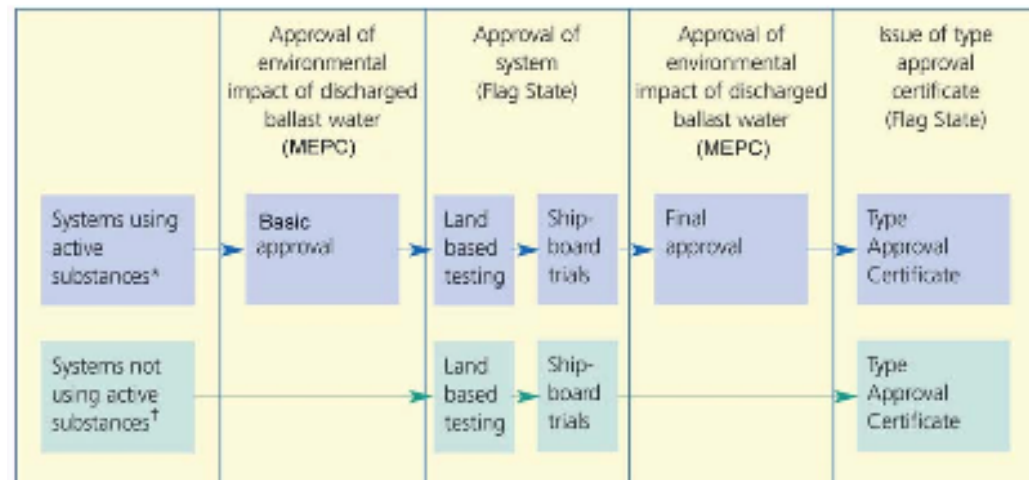
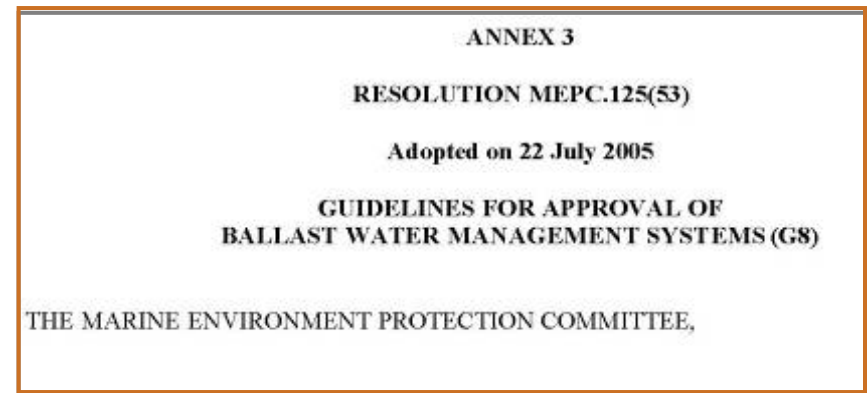
- ▶ Based on using ambient plankton and surrogates
- ▶ Three step verification process:
 - Bench-scale – proof of concept
 - Land-based – simulated shipboard, most rigorous
 - Shipboard – tests practicality
- ▶ USCG will certify treatment technologies, based on verification data (we think)

Evaluation of Treatment Technologies

ETV



IMO



Comparison of ETV, IMO Testing Protocols

Property	ETV	IMO
Salinity	Two (<1PSU, 28-33 PSU)	Two of three
Surrogates	Added at concentrations similar to ambient	Not required
Initial Organism Concentration	10 ² – 10 ³ zooplank/litre 10 ⁵ phytoplank/litre 10 ⁶ bacteria/litre	Organisms >50 μ 10 ⁵ per m ³ Organisms 10-50 μ :10 ⁵ per m ³
Tank Volume	200-300 m ³	200 m ³
Flow Rate	300m ³ /hour	>200m ³ /hour
No. Runs	3 per salinity	5
Hold Time	5 days	5 days
Shipboard	NA	3 tests

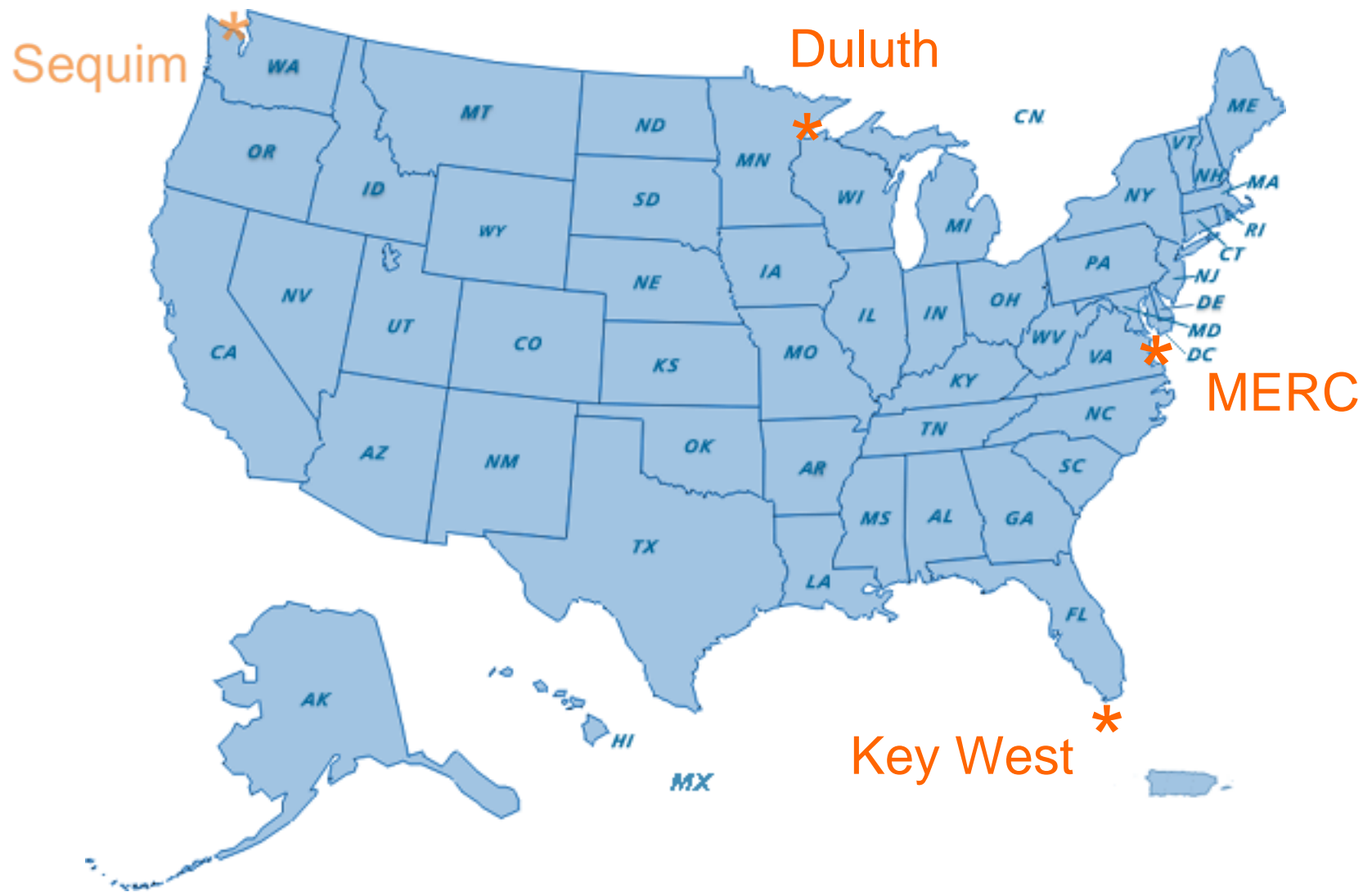
Testing BW Treatment Technologies

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Cal Maritime Academy refit of *Golden Bear*

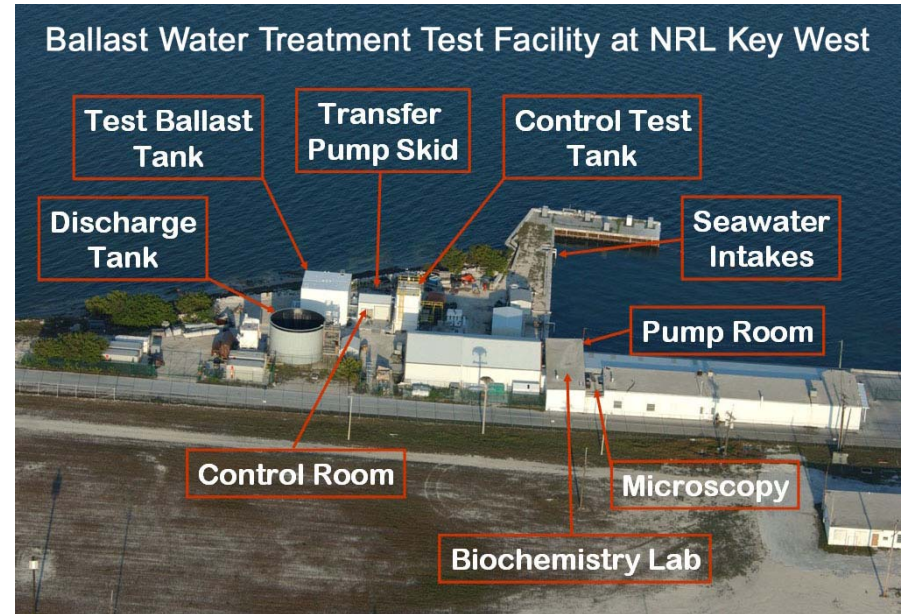


Land Based BW Test Facilities

Land-Based Test Facilities in the US



GSI Duluth MN



NRL Key West FL



Major Land-Based BW Test Facilities



NIVA (Norway)

RDTE Facility
Pacific Northwest Ballast Water Treatment Facility

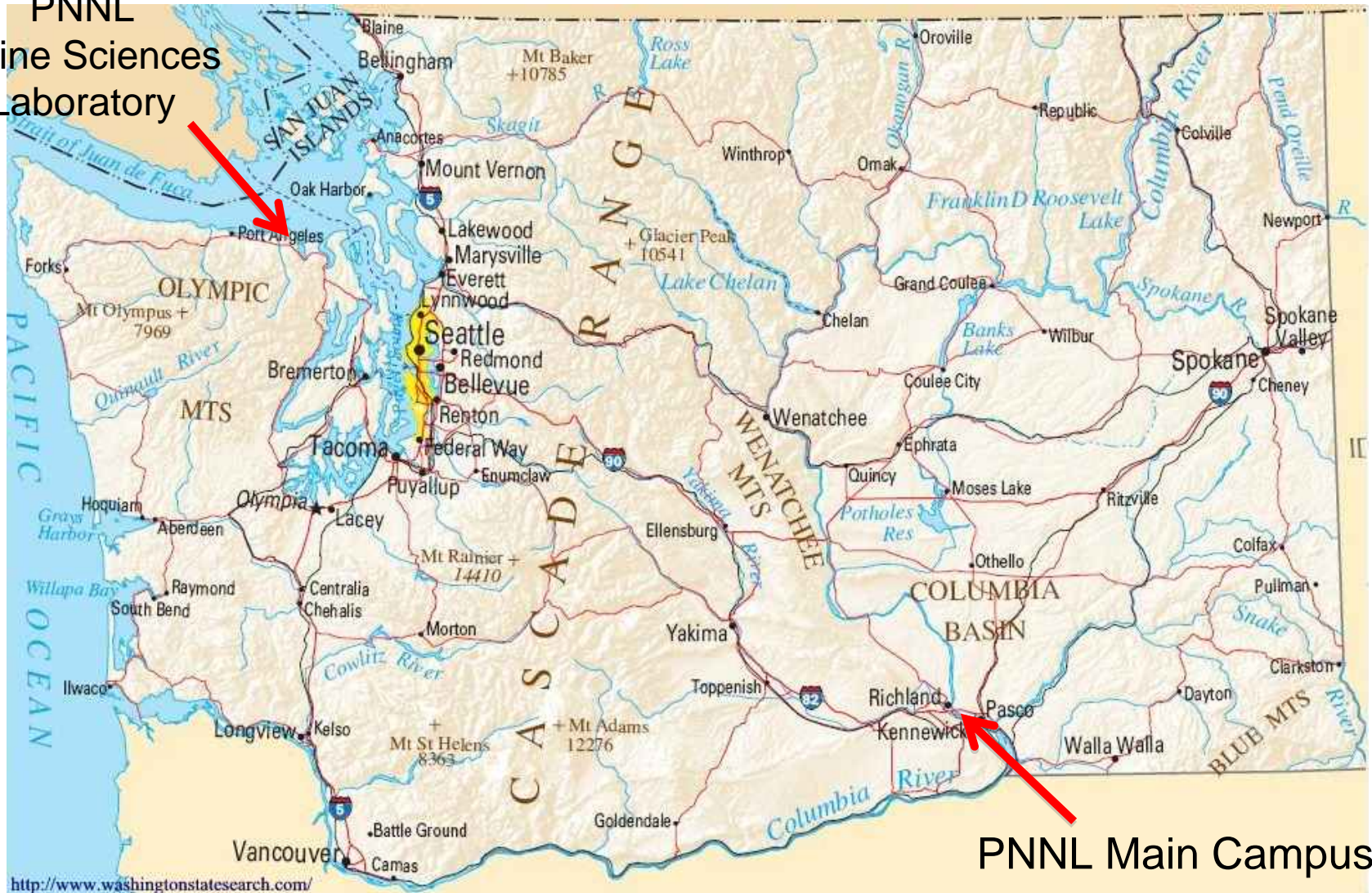
Pacific Northwest National Laboratory, Sequim WA

Sponsored by National Oceanic and Atmospheric Administration
and United States Fish and Wildlife Service



PNNL

Marine Sciences
Laboratory



PNNL Main Campus

Northwest RDTE at PNNL Sequim

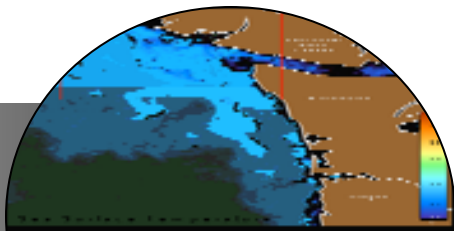
- ▶ \$1.25M Award by NOAA to build land-based test facility
- ▶ Design and construction: October '07-summer '09
- ▶ Only commercial test bed on west coast; one of 2 in country (Duluth MN), only seawater one planned at the moment
- ▶ NRL Key West doing development work
- ▶ Capabilities for testing at Sequim (ecotox, species ecology, chemistry, etc.)



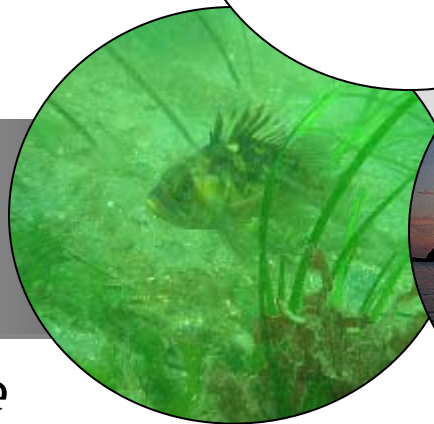
PNNL's MRO Focused in 3 Areas

Coastal assessment & restoration

Protecting people
& the environment



Developing new
products &
energy sources



*Marine
biotechnology/
ecotoxicology*



*Coastal
Security*

Bio Security
Ballast Water RDTE

Securing our
ports, coastlines
& waterways

Rationale for Developing Ballast Water Test Facility at Sequim



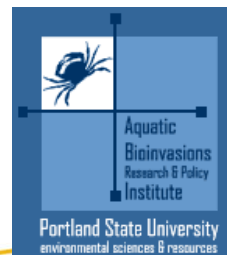
- ▶ High quality abundant seawater and freshwater
- ▶ Reliable permitted wastewater treatment system
- ▶ Adequate land to add facilities
- ▶ Established facilities management and O&M
- ▶ Secure facility
- ▶ Scientific and engineering staff, experience in protocol development, testing, ballast water testing

Expert Staff to meet the needs of the RDTE

The MRO has a total of 85 scientists and engineers in:

- biology
- chemistry
- physical oceanography
- biological oceanography
- ecological sciences
- environmental sciences
- ecotoxicology
- fisheries
- marine invertebrate
- carcinologist
- coastal engineering
- chemical engineering
- civil engineering
- marine engineering
- electrical engineering

Team Partners



Virtual Tour of the Marine Sciences Lab



Marine Sciences Laboratory at Sequim



1965



1973



1982

1965 - Battelle purchased Bugge
Clam cannery site

1973 - Beach wet laboratory & offices

1982 - Uplands analytical chemistry
labs and offices

1992 - Twenty new offices at beach

2004 - New 44 office building
completed

1965 - Battelle purchased Bugge
Clam cannery site

2006 - New Biotechnology Laboratory

Today



Tomorrow





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REVISION HISTORY

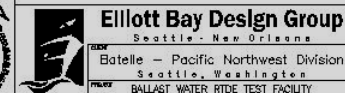
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GENERAL NOTES

1. LAYOUT IS APPROPRIATE. FINAL EQUIPMENT AND PIPE ROUTING TO BE DETERMINED.

REFERENCES

1. 9-0-44 REV 0 BATELLE TOPOGRAPHIC SITE PLAN
2. 07108-528-0 BW TREATMENT TECH - SYSTEM DIAGRAM
3. 07108-528-1 BW TREATMENT TECH - TANK SKETCH
4. 07108-100-832 PURCHASE TECHNICAL SPECIFICATION



BALLAST WATER TREATMENT
TECHNOLOGY - SITE PLAN

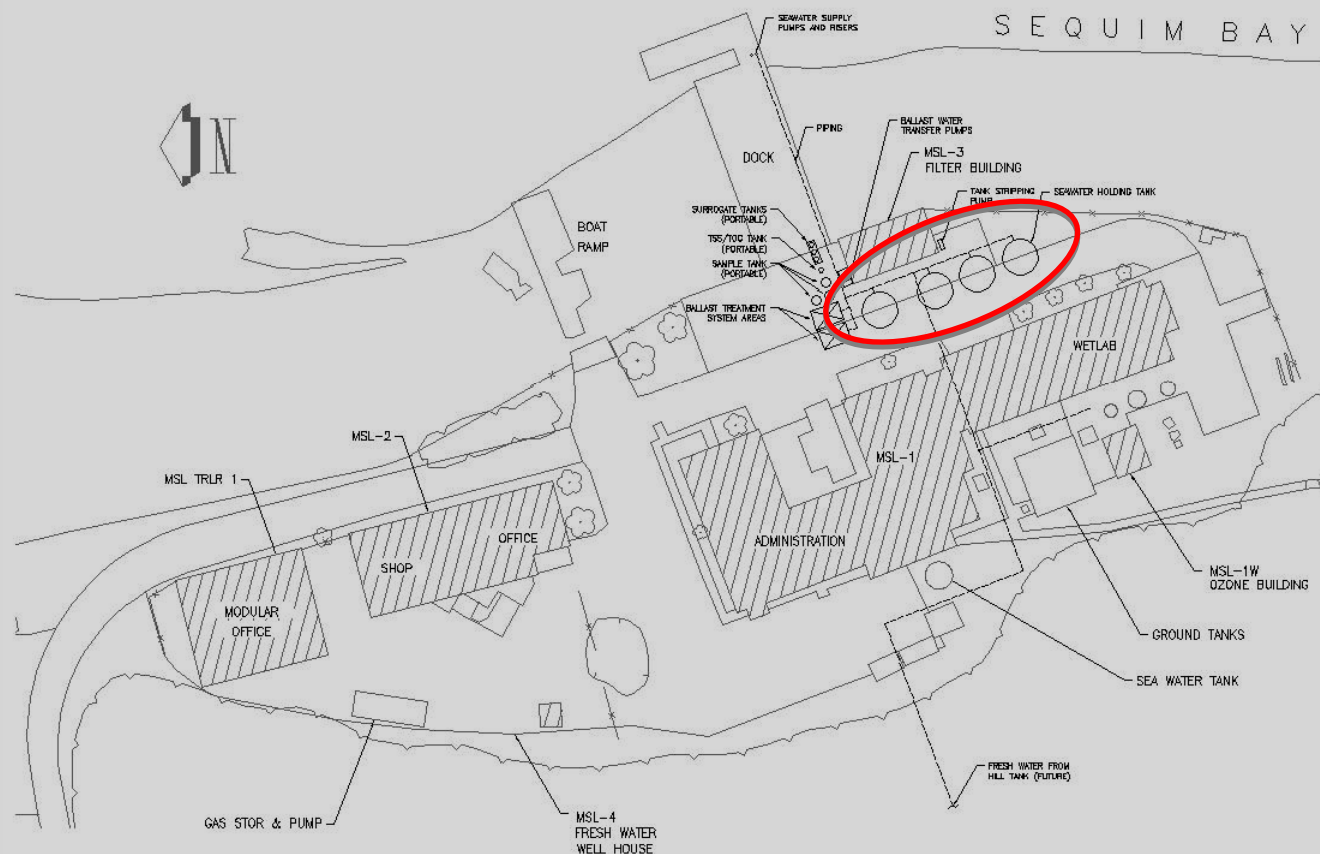
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PDF		1/18/08					
DWG		1/18/08					

07108-529-2

07108-5282-0

SHEET 1 OF 2

PLAN 1-4A
SITE OPTION 1



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PLAN 2-4A
 SITE OPTION 2



REV	NO. 1	DATE	07109-529-2	BY	0
SCALE	1"=30'	FILE NAME	07109-5292-0	SHEET	2 OF 2



- Facility construction to be completed in mid 2009
- We hope to be testing in late 2009

PNNL is looking for partners

- Funding to complete construction
- Serve on advisory panel
- Provide input on testing priorities, research

Moving a technology to shipboard

- ▶ Technology developer applies for verification testing
- ▶ Testing plan developed
- ▶ Land-based testing at PNNL (PNNL staff not developer)
- ▶ Verification results reviewed by USCG, certification
- ▶ Ship-based testing
- ▶ STEP program may be able to expedite the process

Important to think innovatively about BW treatment





Thank you

Questions...?